

# Cluster Server Agent for IBM XIV Mirror Installation and Configuration Guide

Windows

7.0

# Veritas InfoScale™ Availability Agents

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Veritas Technologies LLC  
500 E Middlefield Road  
Mountain View, CA 94043

<http://www.veritas.com>

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[https://sort.veritas.com/data/support/SORT\\_Data\\_Sheet.pdf](https://sort.veritas.com/data/support/SORT_Data_Sheet.pdf)

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# Introducing the agent for IBM XIV Mirror

This chapter includes the following topics:

- [About the agent for IBM XIV Mirror](#)
- [Supported software](#)
- [Supported hardware for IBM XIV Mirror](#)
- [Typical IBM XIV Mirror setup in a VCS cluster](#)
- [IBM XIV Mirror agent functions](#)

## About the agent for IBM XIV Mirror

The Cluster Server (VCS) agent for IBM XIV Mirror manages the roles of the IBM XIV Mirror devices that have been configured for synchronous and asynchronous replication.

## Supported software

For information on the software versions that the agent for IBM XIV Mirror supports, see the Veritas Services and Operations Readiness Tools (SORT) site: <https://sort.veritas.com/agents>.

## Supported hardware for IBM XIV Mirror

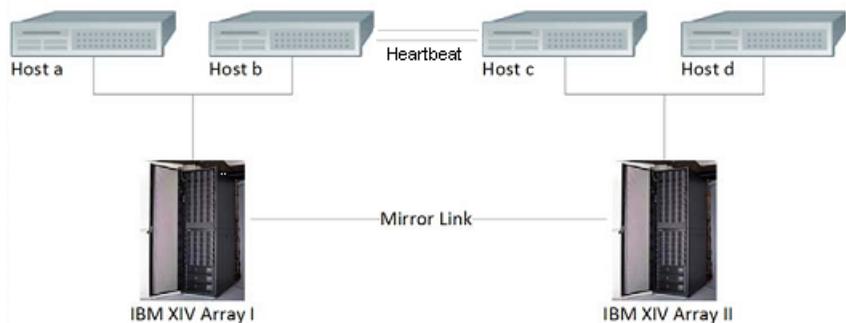
IBM XIV array version: 10.2.2.a and later

IBM XIV Remote Mirror replications must be planned and established between XIV volumes or consistency groups.

## Typical IBM XIV Mirror setup in a VCS cluster

A typical IBM XIV Mirror setup in a VCS cluster includes at least two hosts per IBM XIV array, a heartbeat connection between hosts of different arrays, and a mirror link between the arrays.

**Figure 1-1** Typical IBM XIV Mirror setup in a VCS cluster



This configuration maintains the following links:

- Host a and host b are attached via fibre channel or iSCSI to XIV Array I.
- Host c and host d are attached via fibre channel or iSCSI to XIV Array II.
- Volumes or a consistency group from Array I are mirrored against volumes or a consistency group from Array II.
- Network heartbeating between the two datacenters to determine their health; this network heartbeating could be LLT or TCP/IP. See [“About cluster heartbeats”](#) on page 20.
- In a replicated data cluster environment, all hosts are part of the same cluster. You must connect them with the dual and dedicated networks that support LLT.
- In a global cluster environment, you must attach all hosts in a cluster to the same XIV array.

## IBM XIV Mirror agent functions

The agent performs the following functions:

online	<p>If the state of all local devices is read-write enabled, the agent creates a lock file on the local host to indicate that the resource is online.</p> <p>In other cases, when the consistency group or all local volumes or are Slave, the online function takes various actions depending on the replication link state and replication active state. See <a href="#">“About the agent’s online function”</a> on page 8.</p>
offline	Removes the lock file from the local host.
monitor	<p>Verifies that the lock file exists.</p> <p>If the lock file exists, the monitor function reports the status of the resource as online.</p> <p>If the lock file does not exist, the monitor function reports the status of the resource as offline.</p>
clean	Removes the lock file from the local host.
open	Removes the lock file from the host where the function is called. This action prevents a potential concurrency violation if the service group fails over to another node. Note that the agent does not remove the lock file if the agent was started after a <code>hastop -force</code> command.
info	Modifies or adds the resource information of the XIVMirror resource for showing consolidated information about local volumes or the consistency group. This includes information about the role, synchronization type, link state, mirror state, and sync state.

## About the agent’s online function

The online function attempts to make the specified XIV devices read-writable.

When the consistency group or all the local volumes are Master, the agent creates the lock file and exits.

When the consistency group or all the local volumes are Slave, the mirror link state and the replication active state determine the action the agent takes:

- If the mirror link state is connected, the replication state is active, the agent takes actions according to the mode of replication.
  - If the mode of replication is synchronous and mirror sync state is Consistent, the agent executes the switch role operation sequentially for all the volumes or the consistency group.
  - If the mode of replication is asynchronous and the mirror sync state is RPO OK, the agent takes the following steps:

- Waits until the OnlineTimeout value is about to expire and checks if the consistency group or any of the volumes have sync jobs.
- If the consistency group or any of the volumes have sync jobs, the agent logs an error message and does not initialize the switch role operation for all the mirrors. This ensures that the XIV volumes or consistency group do not end in mixed replication roles due to potential failure of the switch role command because a mirror has a sync job.
- If there is no consistency group or volume with sync jobs, the agent executes the switch role operation sequentially for all the volumes or the consistency group.

If, for any of the volumes, this operation fails with errors MIRROR\_HAS\_SYNC\_JOB or MIRROR\_RETRY\_OPERATION, the agent retries the switch role operation for those volumes after some time, before the OnlineTimeout value is about to expire.

- If the mirror link state is not connected, and the AutoTakeover attribute is 0, the agent does not take any action.
- If the mirror link state is not connected, and the AutoTakeover attribute is 1, the agent executes the change role command.
- If the mirror replication state is inactive, and the SplitTakeover attribute is 0, the agent does not take any action.
- If the mirror replication state is inactive, and the SplitTakeover attribute is 1, the agent executes the change role command. After successful execution of the switch role or change role command, the agent creates the lock file.

If the local volumes have different roles, replication states, replication modes (mix of synchronous and asynchronous replication), and link states, the agent logs an error and does not take any action.

# Installing and removing the agent for IBM XIV Mirror

This chapter includes the following topics:

- [Before you install the agent for IBM XIV Mirror](#)
- [Installing the agent for IBM XIV Mirror](#)
- [Upgrading the agent for IBM XIV Mirror](#)
- [Removing the agent for IBM XIV Mirror](#)

## Before you install the agent for IBM XIV Mirror

Before you install the VCS agent for IBM XIV Mirror, ensure that you install and configure VCS on all nodes in the cluster.

Set up replication and the required hardware infrastructure.

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**Note:** For VCS 6.0, 6.0.1, 6.0.2, and VCS 7.0, make sure that the Microsoft Visual C++ 2010 SP1 (x64) and the Microsoft Visual C++ 2010 SP1 (x86) re-distributable packages are installed on the systems where you need to install the agent pack.

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Install IBM XCLI on each of the cluster nodes on which you plan to install the IBM XIV agent.

## Installing the agent for IBM XIV Mirror

You must install the IBM XIV Mirror agent on each node in the cluster. In global cluster environments, install the agent on each node in each cluster.

**To install the VCS agent for IBM XIV Mirror from the agent pack release**

- 1** Log on to any node in the cluster.  
Ensure that the logged on user has the domain administrative privileges.
- 2** Download the agent pack from the Veritas Services and Operations Readiness Tools (SORT) site: <https://sort.veritas.com/agents>.  
You can download the complete agent pack zip file or the individual agent zip file.
- 3** Uncompress the file to a temporary location.

- 4 If you downloaded the complete agent pack zip file, navigate to the appropriate directory:

Windows 2003 x86	cd1\windows\w2k3x86\vcs\replication\xivmirror_agent\ agentversion\pkgs
Windows 2003 (IA64)	cd1\windows\w2k3IA64\vcs\replication\xivmirror_agent\ agentversion\pkgs
Windows 2003 (x64)	cd1\windows\w2k3x64\vcs\replication\xivmirror_agent\ agentversion\pkgs
Windows 2008 IA64	cd1\windows\w2k8IA64\vcs\replication\xivmirror_agent\ agentversion\pkgs
Windows 2008 x64	cd1\windows\w2k8x64\vcs\replication\xivmirror_agent\ agentversion\pkgs
Windows 2012 x64	cd1\windows\w2k12x64\vcs\replication\ xivmirror_agent\agentversion\pkgs
Windows Server 2012 R2 x64	cd1\windows\w2k12r2x64\vcs\replication\xivmirror_agent\ agent_version\pkgs
Windows Server 2016 x64	cd1\windows\w2k16\vcs\replication\xivmirror_agent\ agent_version\pkgs

- 5 Double-click **vrtsvcxiv.msi**.

Follow the instructions on the wizard to complete the installation of the agent.

The installer logs are created at the location specified in the `%TEMP%` environment variable.

## Upgrading the agent for IBM XIV Mirror

To upgrade an agent, you must first uninstall the agent binaries, and then install the new agent binaries.

**To upgrade the agent for XIV Mirror that was installed from an agent pack release**

- 1 Dump the configuration using the `haconf -dump -makero` command
- 2 Stop the cluster using the `hastop -all -force` command on one of the cluster nodes.
- 3 Perform the following steps sequentially on all the nodes:
  - Uninstall the previous agent pack if any.  
See [“Removing the agent for IBM XIV Mirror”](#) on page 13.
  - Install the agent using the appropriate `vrtsvcxiv.msi` file.  
See [“Installing the agent for IBM XIV Mirror”](#) on page 10.
  - After the installation is complete, run the `hastart` command.

The installer logs are created at the location specified in the `%TEMP%` environment variable.

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**Note:** You can install the agent pack binaries directly on the base VCS release. It is not required to remove base release agent binaries.

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**Note:** Before you bring previously-configured XIV Mirror resources online, consider making the following changes to the attribute values:

- If a consistency group is already available for the mirror pairs that the resource manages, and if you want to leverage the agent's ability to support a consistency group, ensure that you add the consistency group name to the `GroupName` attribute value.

- If you want the agent to continue to manage the mirror pairs as specified in the `LocalVolNames` attribute value, make sure that you set the value of the `IsConsistencyGroup` attribute to 0.

Veritas recommends that you use consistency groups for disaster recovery operations through the XIVMirror agent.

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## Removing the agent for IBM XIV Mirror

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**Note:** Do not attempt to remove the agent if the service groups that access the shared storage are online.

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**Note:** When you uninstall the agent pack, all the agent binaries for XIV Mirror are removed. If you need the agent binaries that were part of the base release, you must manually repair the base release.

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**To remove the agent**

- 1** Open the Windows Control Panel and click **Add or Remove Programs**.
- 2** Click **VRTSVCSXIV.MSI** and click **Remove**.
- 3** Follow the instructions that the install program provides, to complete the uninstallation of the agent.
- 4** Click **Finish**.

# Configuring the agent for IBM XIV Mirror

This chapter includes the following topics:

- [Configuration concepts for the IBM XIV Mirror agent](#)
- [Before you configure the agent for IBM XIV Mirror](#)
- [Configuring the agent for IBM XIV Mirror](#)

## Configuration concepts for the IBM XIV Mirror agent

Review the resource type definition and the attribute definitions for the agent.

### Resource type definition for the IBM XIV Mirror agent

The resource type definition for the XIV Mirror agent is as follows:

```
type XIVMirror (
    static keylist SupportedActions = { }
    static int OpenTimeout = 180
    static int RestartLimit = 1
    static str ArgList[] = {XCliPath, UserLocal, PasswordLocal,
                           UserRemote, PasswordRemote, LocalXIVIPs,
                           RemoteXIVIPs, LocalVolNames, AutoTakeover,
                           SplitTakeover, IsConsistencyGroup,
                           GroupName }

    str XCliPath
    str UserLocal
```

```

str PasswordLocal
str UserRemote
str PasswordRemote
str LocalXIVIPs[]
str RemoteXIVIPs[]
str LocalVolNames[]
int AutoTakeover = 1
int SplitTakeover = 0
int IsConsistencyGroup = 1
str GroupName
temp str VCSResLock
)

```

## Attribute definitions for the XIV Mirror agent

The attributes for the XIV Mirror agent are as follows:

XCliPath	Specifies the XIV command line interface name with its full path.
LocalXIVIPs	List of local XIV IP addresses to connect.
RemoteXIVIPs	List of remote XIV IP addresses to connect.
LocalVolNames	List of local XIV volume names that the agent manages.
AutoTakeover	Indicates whether the agent should enable read/write access to the local devices in the replication relationship when the replication link is broken. If it is set to 0, the agent does not enable read/write access when the replication link is broken.
UserLocal	Specifies the user for the local XIV array.
PasswordLocal	Encrypted password for the local XIV array.  <b>Note:</b> For VCS agent version 7.0.08200 or later, use the VCS encrypted password for the PasswordLocal and the PasswordRemote attributes.  Passwords must be encrypted using the <code>vcscrypt</code> utility.  See <a href="#">“Encrypting passwords for the local and remote XIV arrays”</a> on page 21.
UserRemote	Specifies the user for the remote XIV array.

PasswordRemote	<p>Encrypted password for the remote XIV array.</p> <p><b>Note:</b> For VCS agent version 7.0.08200 or later, use the VCS encrypted password for the PasswordLocal and the PasswordRemote attributes.</p> <p>Passwords must be encrypted using the <code>vcscrypt</code> utility.</p> <p>See <a href="#">“Encrypting passwords for the local and remote XIV arrays”</a> on page 21.</p>
SplitTakeover	<p>Indicates whether the agent should enable read/write access to the local devices in the replication relationship when the replication is in an inactive state. If it is set to 0, the agent does not enable read/write access when the replication is in an inactive state.</p>
IsConsistencyGroup	<p>Specifies if the agent must manage a consistency group or a list of mirror pairs.</p> <p>When the value of this attribute is set to 0, it means that the agent must manage mirror pairs. When the value of this attribute is set to 1, it means that the agent must manage a consistency group.</p> <p><b>Note:</b> If you configure both, the LocalVolNames attribute and the GroupName attribute, the agent refers to the value of the IsConsistencyGroup attribute to determine if the agent must manage mirror pairs or a consistency group.</p> <p>Default Value: 1</p>
GroupName	<p>The name of the consistency group that the agent must manage.</p> <p>A resource can manage only one consistency group.</p>

Consider the following points:

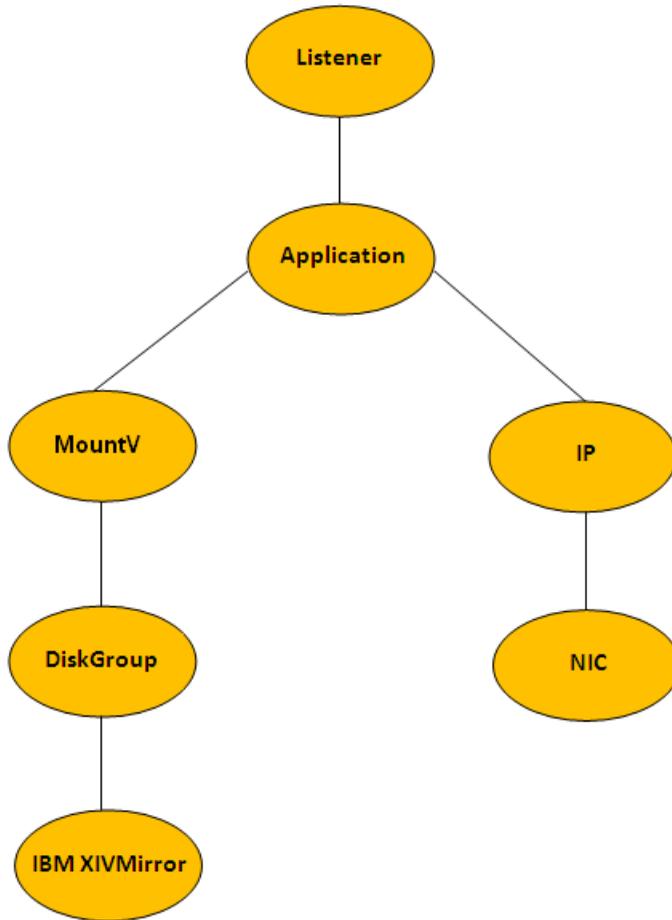
- If you plan to use the environment variables—XIV\_XCLIUSER and XIV\_XCLIPASSWORD, these variables must be set before HAD or VCS starts.
- If you are using XCLI version 3.1.1.x or later, Veritas recommends using the `xcli --protect` command to encrypt the credentials of the local and remote arrays.
- The UserLocal and PasswordLocal attributes are optional when any one of the following conditions are met:
  - The environment variables—XIV\_XCLIUSER and XIV\_XCLIPASSWORD—on the host, point to the username and password of the local XIV array.
  - The local array credentials are encrypted by using the `xcli --protect` command.

- The UserRemote and PasswordRemote attributes are optional when any one of the following conditions are met:
  - The environment variables—XIV\_XCLIUSER and XIV\_XCLIPASSWORD—point to the username and password of the remote XIV array.
  - The remote array credentials are encrypted by using the `xcli --protect` command.

## Sample configuration for the IBM XIV Mirror agent

[Figure 3-1](#) shows the dependency graph for a VCS service group with a resource of type XIVMirror.

**Figure 3-1** Sample configuration for the XIV Mirror agent



You can configure a resource of type XIVMirror in the main.cf file.

A sample `main.cf` file when the agent is configured to manage volume mirror pairs is as follows:

```

XIVMirror sync_xiv-res (
    XcliPath = "C:\Program Files\XIV\GUI10\xcli.exe"
    UserLocal = LocalUser
    PasswordLocal = LocalPassword
    UserRemote = RemoteUser
    PasswordRemote = RemotePassword
    LocalXIVIPs = { "XXX.XXX.XXX.XXX" }
    RemoteXIVIPs = { "YYY.YYY.YYY.YYY" }
  )
  
```

```
LocalVolNames = { Volume_1, Volume_2 }  
IsConsistencyGroup = 0  
)
```

A sample `main.cf` file when the agent is configured to manage a consistency group is as follows:

```
XIVMirror sync_xiv_res (  
    XCliPath = "C:\\Program Files (x86)\\XIV\\GUI10\\xcli.exe"  
    UserLocal = LocalUser  
    PasswordLocal = LocalPassword  
    UserRemote = RemoteUser  
    PasswordRemote = RemotePassword  
    LocalXIVIPs = { "XXX.XXX.XXX.XXX" }  
    RemoteXIVIPs = { "YYY.YYY.YYY.YYY" }  
    GroupName = VCS_CG_Async  
    IsConsistencyGroup = 1  
)
```

## Before you configure the agent for IBM XIV Mirror

Before you configure the agent, review the following information:

- Verify that you have installed the agent on all systems in the cluster.
- Verify that IBM XCLI is installed on each cluster node on which you have installed the agent.
- Verify the hardware setup for the agent.  
See [“Typical IBM XIV Mirror setup in a VCS cluster”](#) on page 7.
- Make sure that the cluster has an effective heartbeat mechanism in place.  
See [“About cluster heartbeats”](#) on page 20.

### About cluster heartbeats

In a replicated data cluster, ensure robust heartbeating by using dual, dedicated networks over which the Low Latency Transport (LLT) runs. Additionally, you can configure a low-priority heartbeat across public networks.

In a global cluster, VCS sends ICMP pings over the public network between the two sites for network heartbeating. To minimize the risk of split-brain, VCS sends ICMP pings to highly available IP addresses. VCS global clusters also notify the administrators when the sites cannot communicate.

To minimize the chances of split-brain, use the steward process.

# Configuring the agent for IBM XIV Mirror

After configuration, the application service group must follow the dependency diagram.

## Configuring the agent manually in a replicated data cluster

Configuring the agent manually in a replicated data cluster involves the following tasks:

### To configure the agent in a replicated data cluster

- 1 Start Cluster Manager and log on to the cluster.
- 2 In each service group that uses replicated data, add a resource of type XIVMirror at the bottom of the service group.
- 3 Configure the attributes of the XIVMirror resource. Note that some attributes must be localized to reflect values for the hosts that are attached to different arrays.
- 4 Set the SystemZones attribute for the service group to reflect which hosts are attached to the same array.

## Configuring the agent manually in a global cluster

Configuring the agent manually in a global cluster involves the following tasks:

### To configure the agent in a global cluster

- 1 Start Cluster Manager and log on to the cluster.
- 2 Add a resource of type XIVMirror at the bottom of the service group.
- 3 Configure the attributes of the XIVMirror resource.
- 4 If the service group is not configured as a global service group, configure the service group using the Global Group Configuration Wizard.
- 5 Repeat step 2 through step 4 for each service group in each cluster that uses replicated data.
- 6 The configuration must be identical on all cluster nodes, both primary and disaster recovery.

## Encrypting passwords for the local and remote XIV arrays

If you choose to use XCLI to specify the user names and passwords for the local and remote XIV arrays, the passwords must be specified and stored in the VCS configuration in an encrypted format. You must use the VCS-provided `vcscrypt`

utility to encrypt the passwords for the local and remote XIV arrays, and you must then specify these encrypted passwords when you configure the PasswordLocal and PasswordRemote attributes, respectively.

The `vcseencrypt` utility also allows you to encrypt the agent passwords using a security key. The security key supports Advanced Encryption Standard (AES) encryption which creates a more secure password for the agent. For details, see the *Cluster Server Administrator's Guide*.

### To encrypt passwords without using security keys

- 1 Run the utility from the command line.

```
vcseencrypt -agent
```

- 2 The utility prompts you to enter the same password twice.

```
Enter New Password:
```

```
Enter Again:
```

After you provide the same password twice, the utility encrypts the password and displays the encrypted password.

- 3 Use this password to edit the VCS configuration file, `main.cf`.

# Managing and testing clustering support for IBM XIV Mirror

This chapter includes the following topics:

- [How VCS recovers from various disasters in an HA/DR setup with IBM XIV Mirror](#)
- [Testing the global service group migration](#)
- [Testing disaster recovery after host failure](#)
- [Testing disaster recovery after site failure](#)
- [Performing failback after a node failure or an application failure](#)
- [Performing failback after a site failure](#)

## How VCS recovers from various disasters in an HA/DR setup with IBM XIV Mirror

This topic lists various failure scenarios and describes how VCS responds to the failures in the following DR cluster configurations.

### Global clusters

When a site-wide global service group or system fault occurs, VCS failover behavior depends on the value of the ClusterFailOverPolicy attribute for the faulted global service group. The VCS agent for IBM XIV Mirror ensures safe and exclusive access to the configured IBM XIV Mirror devices.

See [“Failure scenarios in global clusters”](#) on page 24.

## Replicated data clusters

When service group faults or system faults occur, the VCS failover behavior depends on the value of the AutoFailOver attribute of the faulted service group. The VCS agent for IBM XIV Mirror ensures safe and exclusive access to the configured IBM XIV Mirror devices.

See [“Failure scenarios in replicated data clusters”](#) on page 26.

Refer to the *Cluster Server Administrator's Guide* for more information on the DR configurations and the global service group attributes.

## Failure scenarios in global clusters

The following table lists the failure scenarios in a global cluster configuration and describes the behavior of VCS and the agent in response to the failure.

**Table 4-1** Failure scenarios in a global cluster configuration with the VCS agent for IBM XIV Mirror

Failure	Description and VCS response
Application failure	<p>Application cannot start successfully on any hosts at the primary site.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> <li>■ Causes global service group at the primary site to fault and displays an alert to indicate the fault.</li> <li>■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> <li>■ Auto or Connected—VCS automatically brings the faulted global group online at the secondary site.</li> <li>■ Manual—No action. You must bring the global group online at the secondary site.</li> </ul> </li> </ul> <p>Agent response:</p> <ul style="list-style-type: none"> <li>■ Write enables the devices at the secondary site.</li> <li>■ If replication is suspended and the value of the SplitTakeover attribute is set to 0, the agent takes no action.</li> <li>■ If the write mode is asynchronous, sync state is RPO_OK, and SplitTakeover is set to 1, the agent issues failover.</li> <li>■ Promotes the volumes at the remote site to Master.</li> </ul> <p>See <a href="#">“Performing failback after a node failure or an application failure”</a> on page 33.</p>

**Table 4-1** Failure scenarios in a global cluster configuration with the VCS agent for IBM XIV Mirror (*continued*)

Failure	Description and VCS response
Host failure	<p>All hosts at the primary site fail.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> <li>■ Displays an alert to indicate the primary cluster fault.</li> <li>■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> <li>■ Auto—VCS automatically brings the faulted global group online at the secondary site.</li> <li>■ Manual or Connected—No action. You must bring the global group online at the secondary site.</li> </ul> </li> </ul> <p>The agent does the following:</p> <ul style="list-style-type: none"> <li>■ Write enables the devices at the secondary site.</li> <li>■ In case the replication is suspended and the value of the SplitTakeover attribute is set to 0, no action is taken by agent.</li> <li>■ In case the write mode is asynchronous, sync state is RPO_OK and SplitTakeover is set to 1, the agent will issue failover.</li> <li>■ Promotes the volumes at the remote site to Master.</li> </ul> <p>See <a href="#">“Performing failback after a node failure or an application failure”</a> on page 33.</p>
Site failure	<p>All hosts and the storage at the primary site fail.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> <li>■ Displays an alert to indicate the cluster fault.</li> <li>■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> <li>■ Auto—VCS automatically brings the faulted global group online at the secondary site.</li> <li>■ Manual or Connected—No action. You must bring the global group online at the secondary site.</li> </ul> </li> </ul> <p>Agent response: The agent does the following based on the value of the AutoTakeover attribute of the XIVMirror resource:</p> <ul style="list-style-type: none"> <li>■ 1—The agent issues the <code>failover</code> command to promote the volumes at the remote site to Master.</li> <li>■ 0—No action is taken by the agent. The XIVMirror resource is faulted.</li> </ul> <p>See <a href="#">“Performing failback after a site failure”</a> on page 34.</p>

**Table 4-1** Failure scenarios in a global cluster configuration with the VCS agent for IBM XIV Mirror (*continued*)

Failure	Description and VCS response
Replication link failure	<p>Replication link between the arrays at the two sites fails.</p> <p>VCS response: No action.</p> <p>Agent response: The agent does the following based on the value of the AutoTakeover attribute of the XIVMirror resource:</p> <ul style="list-style-type: none"> <li>■ 1—The agent issues the <code>failover</code> command to promote the volumes at the remote site to Master.</li> <li>■ 0—No action is taken by the agent. The XIVMirror resource is faulted.</li> </ul>
Network failure	<p>The network connectivity and the replication link between the sites fail.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> <li>■ VCS at each site concludes that the remote cluster has faulted.</li> <li>■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> <li>■ Manual or Connected—No action. You must confirm the cause of the network failure from the cluster administrator at the remote site and fix the issue.</li> <li>■ Auto—VCS brings the global group online at the secondary site which may lead to a site-wide split brain. This causes data divergence between the devices on the primary and the secondary arrays.</li> </ul> </li> </ul> <p>When the network (WAC and replication) connectivity is restored, you must manually resync the data.</p> <p><b>Note:</b> Veritas recommends that the value of the ClusterFailOverPolicy attribute is set to Manual for all global groups to prevent unintended failovers due to transient network failures.</p>
Storage failure	<p>The array at the primary site fails.</p> <p>VCS response at the secondary site:</p> <ul style="list-style-type: none"> <li>■ Causes the global service group at the primary site to fault and displays an alert to indicate the fault.</li> <li>■ Does the following based on the ClusterFailOverPolicy global service group attribute: <ul style="list-style-type: none"> <li>■ Auto or Connected—VCS automatically brings the faulted global service group online at the secondary site.</li> <li>■ Manual—No action. You must bring the global group online at the secondary site.</li> </ul> </li> </ul>

## Failure scenarios in replicated data clusters

The following table lists the failure scenarios in a replicated data cluster configuration, and describes the behavior of VCS and the agent in response to the failure.

**Table 4-2** Failure scenarios in a replicated data cluster configuration with VCS agent for IBM XIV Mirror

Failure	Description and VCS response
Application failure	<p>Application cannot start successfully on any hosts at the primary site.</p> <p>VCS response:</p> <ul style="list-style-type: none"> <li>■ Causes the service group at the primary site to fault.</li> <li>■ Does the following based on the AutoFailOver attribute for the faulted service group: <ul style="list-style-type: none"> <li>■ 1—VCS automatically brings the faulted service group online at the secondary site.</li> <li>■ 2—You must bring the service group online at the secondary site.</li> </ul> </li> </ul> <p>The agent does the following:</p> <ul style="list-style-type: none"> <li>■ Write enables the devices at the secondary site.</li> <li>■ In case the replication is suspended and the value of the SplitTakeover attribute is set to 0, no action is taken by agent.</li> <li>■ In case the write mode is asynchronous, sync state is RPO_OK and SplitTakeover is set to 1, the agent will issue failover.</li> <li>■ Promotes the volumes at the remote site to Master.</li> </ul> <p>See <a href="#">“Performing failback after a node failure or an application failure”</a> on page 33.</p>
Host failure	<p>All hosts at the primary site fail.</p> <p>VCS response:</p> <ul style="list-style-type: none"> <li>■ Causes the service group at the primary site to fault.</li> <li>■ Does the following based on the AutoFailOver attribute for the faulted service group: <ul style="list-style-type: none"> <li>■ 1—VCS automatically brings the faulted service group online at the secondary site.</li> <li>■ 2—You must bring the service group online at the secondary site.</li> </ul> </li> </ul> <p>The agent does the following:</p> <ul style="list-style-type: none"> <li>■ Write enables the devices at the secondary site.</li> <li>■ In case the replication is suspended and the value of the SplitTakeover attribute is set to 0, no action is taken by agent.</li> <li>■ In case the write mode is asynchronous, sync state is RPO_OK and SplitTakeover is set to 1, the agent will issue failover.</li> <li>■ Promotes the volumes at the remote site to Master.</li> </ul> <p>See <a href="#">“Performing failback after a node failure or an application failure”</a> on page 33.</p>

**Table 4-2** Failure scenarios in a replicated data cluster configuration with VCS agent for IBM XIV Mirror (*continued*)

Failure	Description and VCS response
Site failure	<p>All hosts and the storage at the primary site fail.</p> <p>VCS response:</p> <ul style="list-style-type: none"> <li>■ Causes the service group at the primary site to fault.</li> <li>■ Does the following based on the AutoFailOver attribute for the faulted service group: <ul style="list-style-type: none"> <li>■ 1—VCS automatically brings the faulted service group online at the secondary site.</li> <li>■ 2—You must bring the service group online at the secondary site.</li> </ul> </li> </ul> <p>Agent response: The agent does the following based on the value of the AutoTakeover attribute of the XIVMirror resource:</p> <ul style="list-style-type: none"> <li>■ 1—The agent issues the <code>failover</code> command to promote the volumes at the remote site to Master.</li> <li>■ 0—No action is taken by the agent. The XIVMirror resource is faulted.</li> </ul> <p>See <a href="#">“Performing failback after a site failure”</a> on page 34.</p>
Replication link failure	<p>Replication link between the arrays at the two sites fails.</p> <p>VCS response: No action.</p> <p>Agent response: The agent does the following based on the value of the AutoTakeover attribute of the XIVMirror resource:</p> <ul style="list-style-type: none"> <li>■ 1—The agent issues the <code>failover</code> command to promote the volumes at the remote site to Master.</li> <li>■ 0—No action is taken by the agent. The XIVMirror resource is faulted.</li> </ul>

**Table 4-2** Failure scenarios in a replicated data cluster configuration with VCS agent for IBM XIV Mirror (*continued*)

Failure	Description and VCS response
Network failure	<p>The LLT and the replication links between the sites fail.</p> <p>VCS response:</p> <ul style="list-style-type: none"> <li>■ VCS at each site concludes that the nodes at the other site have faulted.</li> <li>■ Does the following based on the AutoFailOver attribute for the faulted service group: <ul style="list-style-type: none"> <li>■ 2—No action. You must confirm the cause of the network failure from the cluster administrator at the remote site and fix the issue.</li> <li>■ 1—VCS brings the service group online at the secondary site which leads to a cluster-wide split brain. This causes data divergence between the devices on the arrays at the two sites.</li> </ul> </li> </ul> <p>When the network (LLT and replication) connectivity is restored, VCS takes all the service groups offline on one of the sites and restarts itself. This action eliminates concurrency violation where in the same group is online at both the sites.</p> <p><b>Note:</b> Veritas recommends that the value of the AutoFailOver attribute is set to 2 for all service groups to prevent unintended failovers due to transient network failures.</p> <p>Agent response: Similar to the site failure.</p>
Storage failure	<p>The array at the primary site fails.</p> <p>VCS response:</p> <ul style="list-style-type: none"> <li>■ Causes the service group at the primary site to fault and displays an alert to indicate the fault.</li> <li>■ Does the following based on the AutoFailOver attribute for the faulted service group: <ul style="list-style-type: none"> <li>■ 1—VCS automatically brings the faulted service group online at the secondary site.</li> <li>■ 2—You must bring the service group online at the secondary site.</li> </ul> </li> </ul>

## Testing the global service group migration

After you configure the Cluster Server agent for IBM XIV Mirror, verify that the global service group can migrate to hosts across the sites. Depending on your DR configuration, perform one of the following procedures.

### To test the global service group migration in global cluster setup

- 1 Fail over the global service group from the primary site to the secondary site.

Perform the following steps:

- Switch the global service group from the primary site to any node in the secondary site.

```
hagrp -switch global_group -any -clus cluster_name
```

VCS brings the global service group online on a node at the secondary site.

- Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

**2** Fail back the global service group from the secondary site to the primary site.

Perform the following steps:

- Switch the global service group from the secondary site to the primary site.

```
hagrp -switch global_group -any -clus cluster_name
```

VCS brings the global service group online at the primary site.

- Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

**To test service group migration in replicated data cluster setup**

**1** Fail over the service group from the primary site to the secondary site.

Perform the following steps:

- Switch the service group from the primary site to any node in the secondary site.

```
hagrp -switch service_group -to sys_name
```

VCS brings the service group online on a node at the secondary site.

- Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

**2** Fail back the service group from the secondary site to the primary site.

Perform the following steps:

- Switch the service group from the secondary site to any node in the primary site.

```
hagrp -switch service_group -to sys_name
```

VCS brings the service group online on a node at the primary site.

- Verify that the volumes at the primary site are write-enabled, and the role of volumes is Master.

# Testing disaster recovery after host failure

Review the details on host failure and how VCS and the Cluster Server agent for IBM XIV Mirror behave in response to the failure.

See [“Failure scenarios in global clusters”](#) on page 24.

## To test disaster recovery for host failure in global cluster setup

- 1 Halt the hosts at the primary site.

The value of the ClusterFailOverPolicy attribute for the faulted global group determines the VCS failover behavior.

- Auto—VCS brings the faulted global service group online at the secondary site.
- Manual or Connected—You must bring the global service group online at the secondary site.

On a node in the secondary site, run the following command:

```
hagrp -online -force global_group -any
```

- 2 Verify that the global service group is online at the secondary site.

```
hagrp -state global_group
```

- 3 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

## To test disaster recovery for host failure in replicated data cluster setup

- 1 Halt the hosts at the primary site.

The value of the AutoFailOver attribute for the faulted service group determines the VCS failover behavior.

- 1—VCS brings the faulted service group online at the secondary site.
- 2—You must bring the service group online at the secondary site.

On a node in the secondary site, run the following command:

```
hagrp -online service_group -to sys_name
```

- 2 Verify that the service group is online at the secondary site.

```
hagrp -state global_group
```

- 3 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

# Testing disaster recovery after site failure

Review the details on site failure and how VCS and the Cluster Server agent for IBM XIV Mirror behave in response to the failure.

See [“Failure scenarios in global clusters”](#) on page 24.

See [“Failure scenarios in replicated data clusters”](#) on page 26.

Depending on the DR configuration, perform one of the following procedures to test the disaster recovery in the event of site failure.

## To test disaster recovery for site failure in global cluster setup

- 1 Halt all nodes and the arrays at the primary site.

If you cannot halt the array at the primary site, then disable the replication link between the two arrays.

The value of the ClusterFailOverPolicy attribute for the faulted global group determines the failover behavior of VCS.

- Auto—VCS brings the faulted global group online at the secondary site.
- Manual or Connected—You must bring the global group online at the secondary site.

On a node in the secondary site, run the following command:

```
hagrp -online -force global_group -any
```

- 2 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.
- 3 Verify that the global service group is online at the secondary site.

```
hagrp -state global_group
```

## To test disaster recovery for site failure in replicated data cluster setup

- 1 Halt all hosts and the arrays at the primary site.

If you cannot halt the array at the primary site, then disable the replication link between the two arrays.

The value of the AutoFailOver attribute for the faulted global service group determines the VCS failover behavior.

- 1—VCS brings the faulted global service group online at the secondary site.
- 2—You must bring the global service group online at the secondary site.

On a node in the secondary site, run the following command:

```
hagrp -online service_group -sys sys_name
```

- 2 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.
- 3 Verify that the global service group is online at the secondary site.

```
hagrp -state global_group
```

## Performing failback after a node failure or an application failure

Review the details on node failure and application failure and how VCS and the agent for IBM XIV Mirror behave in response to these failures.

See [“Failure scenarios in global clusters”](#) on page 24.

See [“Failure scenarios in replicated data clusters”](#) on page 26.

After the nodes at the primary site are restarted, you can perform a failback of the global service group to the primary site. Perform the procedure that applicable to your DR configuration.

### To perform failback after a node failure or an application failure in global cluster

- 1 Switch the global service group from the secondary site to any node in the primary site.

```
hagrp -switch global_group -any -clus cluster_name
```

VCS brings the global service group online at the primary site.

- 2 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

### To perform failback after a host failure or an application failure in replicated data cluster

- 1 Switch the global service group from the secondary site to any node in the primary site.

```
hagrp -switch service_group -to sys_name
```

VCS brings the global service group online on a node at the primary site.

- 2 Verify that the volumes at the secondary site are write-enabled, and the role of volumes is Master.

# Performing failback after a site failure

See [“Failure scenarios in global clusters”](#) on page 24.

## To perform failback after a site failure in global cluster

- 1 Take the global service group offline at the secondary site. On a node at the secondary site, run the following command:

```
hagrp -offline global_group -any
```

- 2 Bring the global service group online at the primary site. On a node in the primary site, run the following command:

```
hagrp -online global_group -any
```

## To perform failback after a site failure in replicated data cluster

- 1 Take the global service group offline at the secondary site. On a node in the secondary site, run the following command:

```
hagrp -offline service_group -sys sys_name
```

- 2 Bring the global service group online at the primary site. On a node in the primary site, run the following command:

```
hagrp -online service_group -sys sys_name
```